Table 5.1 - U.S. Primary and Delivered Energy – Overview

(Quadrillion Btu per year)

	1980	1990	2000	2001	2010	2020	2025
Primary Consumption by Source							
Petroleum [1]	34.20	33.55	38.40	38.23	44.65	52.60	56.56
Natural Gas	20.39	19.73	24.04	23.22	27.75	32.96	35.81
Coal	15.39	19.16	22.66	21.97	24.98	27.68	29.42
Nuclear	2.74	6.10	7.86	8.03	8.36	8.43	8.43
Renewable [2]	5.71	6.21	6.46	5.68	7.23	8.28	8.78
Other [3]	0	-0.12	0.03	-0.04	0.29	0.17	0.07
Total Primary	78.44	84.58	99.31	96.95	113.26	130.12	139.07
Primary Consumption by Sector							
Residential	15.90	16.88	20.52	20.16	22.75	24.47	25.43
Commercial	10.63	13.27	17.24	17.44	20.15	23.52	25.33
Industrial	32.21	31.90	34.86	32.60	36.99	41.69	44.35
Transportation	19.70	22.53	26.70	26.75	33.36	40.44	43.97
Total Primary	78.44	84.57	99.32	96.95	113.26	130.12	139.07
Delivered Consumption by Sector							
Residential	7.50	6.46	7.13	6.90	12.47	13.51	14.10
Commercial	4.10	3.81	4.22	4.24	9.69	11.38	12.30
Industrial	22.67	21.24	22.91	21.63	28.76	32.61	34.81
Transportation	19.66	22.47	26.64	26.68	33.17	40.20	43.70
Total Delivered	53.93	53.98	60.90	59.45	84.10	97.70	104.91

Sources: EIA, *Annual Energy Outlook 2003,* DOE/EIA-0383 (2003) (Washington, D.C., January 2003), Tables A1 and A2; EIA*, Annual Energy Review,* DOE/EIA-0384(2001) (Washington, D.C., November 2002), Tables 2.1a-f.

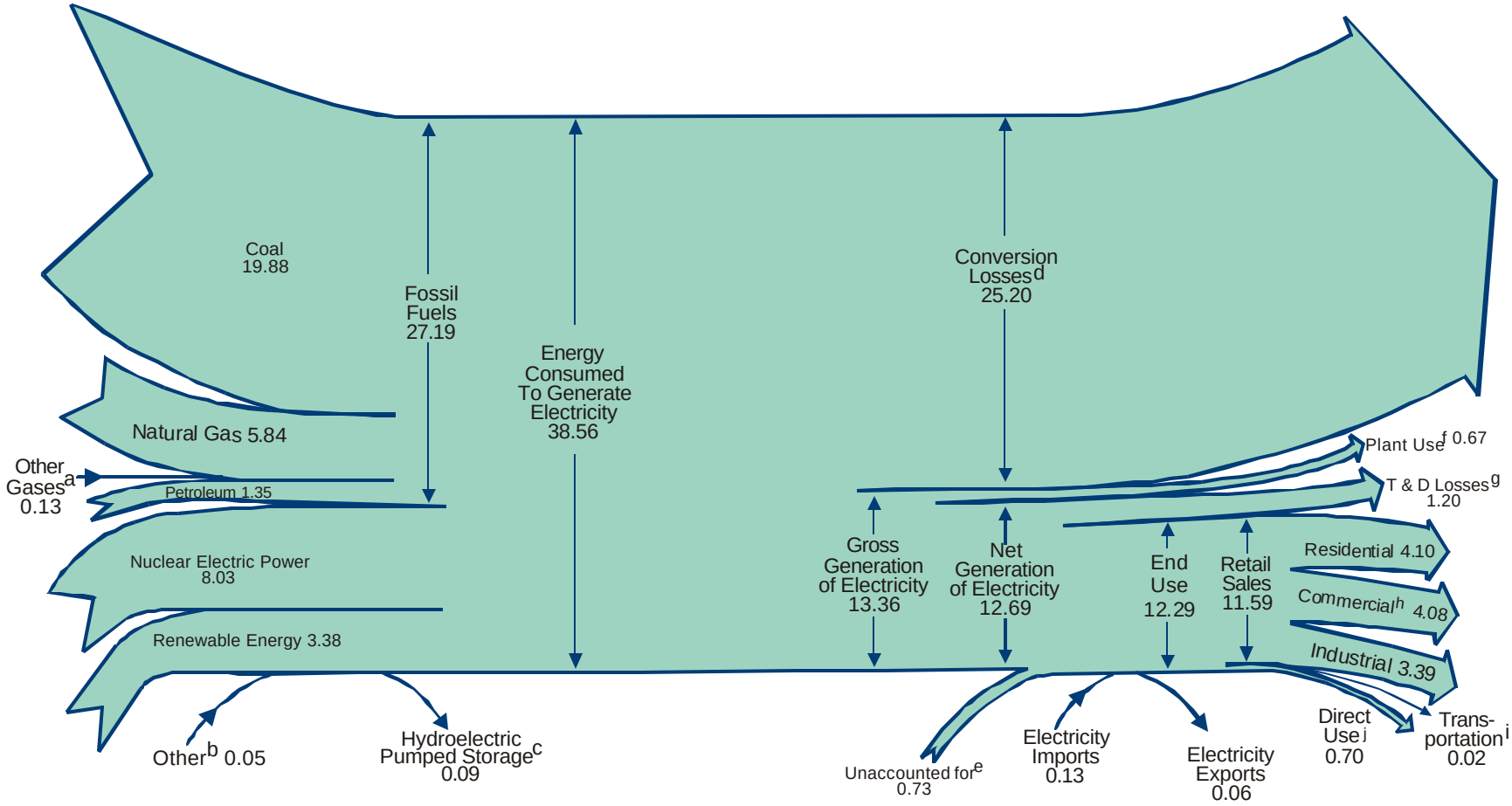
Notes:

[1] Includes natural gas plant liquids, crude oil consumed as a fuel, and nonpetroleum-based liquids for blending, such as ethanol.

[2] Includes grid-connected electricity from conventional hydroelectric; wood and wood waste; landfill gas; municipal solid waste; other biomass; wind; photovoltaic and solar thermal sources; non-electric energy from renewable sources, such as active and passive solar systems, and wood; and both the ethanol and gasoline components of E85, but not the ethanol components of blends less than 85 percent. Excludes electricity imports using renewable sources and nonmarketed renewable energy.

[3] Includes liquid hydrogen, methanol, supplemental natural gas, and some domestic inputs to refineries. Included in Renewable (conventional hydropower) for 1980.

Table 5.2 - Electricity Flow Diagram (Quadrillion Btu)



Source: EIA, *Annual Energy Review,* DOE/EIA-0384(2001) (Washington, D.C., November 2002), Diagram 5.

Notes:

a Blast furnace gas, propane gas, and other manufactured waste gases derived from fossil fuels.

b Batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.

c Pumped storage facility production minus energy used for pumping.

d Approximately two-thirds of all energy used to generate electricity.

e Data collection frame differences and non-sampling error.

f Electric energy used in the operation of power plants, estimated as 5 percent of gross generation.

g Transmission and distribution losses, estimated as 9 percent of gross generation.

h Commercial retail sales plus approximately 95 percent of public street and highway lighting, other sales to public authorities, sales to railroads and railways, and interdepartmental sales.

i Approximately 5 percent of public street and highway lighting, other sales to public authorities, sales to railroads and railways, and interdepartmental sales.

j Commercial and industrial facility use of onsite net electricity generation.

Table 5.3 - Electricity Overview

(Billion Kilowatthours, unless otherwise noted)

	1980	1990	2000	2001	2010	2020	2025
Electric Power Sector Generation [1]	2,286	2,896	3,638	3,562	4,295	5,059	5,478
Electric Utility	2,286	2,808	3,015	2,630	NA	NA	NA
Independent Power Producer [2]	NA	88	622	932	NA	NA	NA
End Use Sector Generation [3]	3	128	165	158	48	67	82
Total Generation	2,290	3,024	3,802	3,719	4,343	5,126	5,560
Capability (gigawatts)							
Electric Power Sector [4]	579	710	783	826	1,807	2,110	2,305
End Use Sector [3]	NA	24	30	29	35	42	47
Total Capability	579	734	813	855	1,841	2,152	2,353
Imports from Canada/Mexico	25	18	49	38	45	24	14
Exports to Canada/Mexico	4	16	15	18	16	8	8
Loss and Unaccounted for [5]	216	199	231	138	NA	NA	NA
Retail Sales [6]	2,094	2,713	3,421	3,397	4,101	4,850	5,252
Direct Use [7]	NA	115	183	205	202	230	254
Total End Use	2,094	2,827	3,605	3,602	4,303	5,080	5,506

Sources: EIA, *Annual Energy Outlook 2003,* DOE/EIA-0383 (2003) (Washington, D.C., January 2003), Tables A8, A9 and A10; EIA, *Annual Energy Review 2001,* DOE/EIA-0384(2001) (Washington, D.C., November 2002), Tables 8.1, 8.7b, and 8.7c.

Notes:

[1] The electric power sector (electric utilities and independent power producers) comprises electricity-only and combined-heat-and-power (CHP) plants whose primary business is to sell electricity, or electricity and heat, to the public.

[2] Independent power producer generation reported beginning in 1989. IPP generation is not separated from utility generation in forecast data.

[3] Commercial and industrial combined-heat-and-power (CHP) and electricity-only plants.

[4] Through 1988, data are for net summer capacity at electric utilities only. Beginning in 1989, data also include net summer capacity at independent power producers, commercial plants, and industrial plants.

[5] Energy losses that occur between the point of generation and delivery to the customer, and data collection frame differences and nonsampling error.

[6] Electricity retail sales to ultimate customers reported by electric utilities and other energy service providers.

[7] Commercial and industrial facility use of onsite net electricity generation; and electricity sales among adjacent or co-located facilities for which revenue information is not available.

Table 5.4 - Consumption of Fossil Fuels by Electric Generators

	1980	1990	2000	2001	2010	2020	2025
Coal (million short tons) [1]	569	780	983	964	1,123	1,263	1,350
Distillate Fuel Oil (million barrels) [2]	29	16	30	30	19	17	29
Residual Fuel Oil (million barrels) [3]	391	182	138	157	49	57	57
Petroleum Coke (million short tons)	NA	0.02	0.4	0.3	NA	NA	NA
Other Liquids (million barrels) [4]	0.2	1	3	4	NA	NA	NA
Total Petroleum (million barrels) [5]	421	203	184	205	68	74	86
Natural Gas (billion cubic feet)	3,682	3,139	5,014	5,039	6,800	9,390	10,560
Stocks of Coal and Petroleum (end of year) [6]							
Coal (million short tons)	183	156	102	129	NA	NA	NA
Petroleum (million barrels) [7]	136	84	41	56	NA	NA	NA

Sources: EIA, *Annual Energy Outlook 2003,* DOE/EIA-0383 (2003) (Washington, D.C., January 2003), Tables A2, A13 and A16; EIA, *Annual Energy Review 2001,* DOE/EIA-0384(2001) (Washington, D.C., November 2002), Table 8.3b, 8.3c, and 8.4.

Notes:
Data is for electric power sector consumption only. Data include fuel consumption to produce electricity by combined heat and power plants. Through 1988, consumption data are for electric utilities only. Beginning in 1989, consumption data also include independent power producers.

[1] Anthracite, bituminous coal, subbituminous coal, lignite, waste coal, and synthetic coal.

[2] For 1980-2001, electric utility data are for light oil (fuel oil nos. 1 and 2, and small amounts of kerosene and jet fuel). Forecast values calculated from quadrillion Btu using conversion factor 5.825 MMBtu/barrel.

[3] For 1980-2001, electric utility data are for heavy oil (fuel oil nos. 5 and 6, and small amounts of fuel oil no. 4). Forecast values calculated from quadrillion Btu using conversion factor 6.287 MMBtu/barrel.

[4] Jet fuel, kerosene, other petroleum liquids, and waste oil.

[5] Petroleum coke is converted from short tons to barrels by multiplying by 5. Total Petroleum is calculated sum.

[6] Through 1998, data are for stocks at electric utilities only. Beginning in 2000, data also include stocks at independent power producers.

[7] Includes distillate fuel oil, residual fuel oil, and petroleum coke.

Table 5.5 - Electric Power Sector Energy Consumption

(Trillion Btu)

	1980	1990	2000	2001	2010	2020	2025
Coal	12,123	16,222	20,153	19,620	22,650	25,350	27,090
Natural Gas	3,810	3,224	5,120	5,170	6,930	9,570	10,760
Petroleum	2,634	1,271	1,145	1,281	420	460	520
Other Gas [1]	NA	6	19	23	NA	NA	NA
Total Fossil Fuels	18,567	20,723	26,438	26,094	30,290	35,550	38,440
Nuclear Electric Power	2,739	6,104	7,862	8,028	8,360	8,430	8,430
Hydroelectric Pumped Storage [2]	NA	-36	-57	-90	NA	NA	NA
Conventional Hydroelectric	2,867	3,000	2,768	2,181	3,100	3,080	3,080
Wood	3	101	126	130	260	270	300
Waste	2	179	294	288	400	430	430
Geothermal	110	315	296	290	490	860	1,010
Solar [3]	NA	4	5	5	10	20	20
Wind	NA	24	57	59	240	340	370
Total Renewable Energy	2,982	3,623	3,547	2,953	4,500	5,000	5,210
Electricity Imports	NA	NA	NA	NA	290	170	70
Other [4]	NA	(s)	1	5	NA	NA	NA
Total Primary Consumption	24,287	30,414	37,792	36,990	43,150	48,980	52,080

Sources: EIA, *Annual Energy Review 2001*, DOE/EIA-0384(2001) (Washington, D.C., November 2002), Table 2.2b and EIA, *Annual Energy Outlook 2003,* DOE/EIA-0383 (2003) (Washington, D.C., January 2003), Tables A2 and A18.

Notes:

Data are for fuels consumed to produce electricity at both electricity-only and at combined heat and power plants. Through 1988, data are for consumption at electric utilities only. Beginning in 1989, data also include consumption at independent power producers.

[1] Blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels.

[2] Pumped storage facility production minus energy used for pumping. 1980 data included in Conventional Hydroelectric.

[3] Solar thermal and photovoltaic energy.

[4] Batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.

Table 5.6 - Fossil Fuel Generation by Age of Generating Units

(Megawatts)

	1980	1990	2000	2001
<5 years	91,193	39,369	51,445	85,019
6-10 years	134,882	53,276	43,308	41,660
11-20 years	145,580	223,801	91,624	86,323
21-30 years	97,512	143,828	220,915	209,781
31-40 years	20,953	91,633	140,778	155,531
41-50 years	4,102	14,992	85,222	89,979
>50 years	4,441	2,860	12,378	16,112
Total	498,663	569,760	645,670	684,406

Source: PowerDat, © 2002, Platts, a division of the McGraw-Hill companies. Query by NREL 5/03.

Note:
Total MW does not equal fossil fuel generation capacity cited in Table 6.1.

Table 5.7 - Nuclear Generation by Age of Generating Units

(Megawatts)

	1980	1990	2000	2001
<5 years	16,211	30,374	1,270	1,270
6-10 years	33,458	25,528	1,215	1,215
11-20 years	6,410	48,320	55,901	51,402
21-30 years	308.68	6,070	43,988	46,238
31-40 years	0	0	4,092	6,341
Total	56,387	110,291	106,466	106,466

Source: PowerDat, © 2002, Platts, a division of the McGraw-Hill companies. Query by NREL 5/03.

Note:
Total MW does not equal nuclear generation capacity cited in Table 6.1.

Table 5.8 - Operational Renewable Energy Generating Capacity

(Megawatts)

	1980	1990	2000	2001	2002
Bioenergy					
Agricultural Residues	40	165	373	373	373
BioGas	18	359	922	979	995
Municipal Solid Waste	263	2,172	2,970	2,970	2,970
Timber Residues	3,576	6,306	7,447	7,458	7,472
Bioenergy Total[1]	3,897	9,002	11,711	11,780	11,810
Geothermal	802	2,540	2,779	2,779	2,779
Photovoltaic[2]	0.025	4.100	28.048	37.268	57.442
Solar Thermal	0	274	354	354	354
Hydro[3]	80,491	90,955	94,322	94,333	94,333
Wind[4]	0.06	1,569	2,817	4,227	4,905
Total	85,190	104,343	112,012	113,511	114,239

Source: *Renewable Electric Plant Information System (REPiS Database)*, Version 7, National Renewable Energy Laboratory, 2003, http://www.eren.doe.gov/repis/index.html.

Notes:

Totals do not equal renewable generation capacity cited in Table 6.1.

[1] There are an additional 65.45 MW of Ag Waste, 5.476 MW of Bio Gas, 32.1 MW of MSW and 483.31 MW of Wood Residues that are not accounted for here because they have no specific online date.

[2] There are an additional 2.0 MW of photovoltaic capacity that are not accounted for here because they have no specific online date.

[3] There are an additional 24 MW of hydroelectric capacity that are not accounted for here because they have no specific online date.

[4] There are an additional 204.9 MW of wind capacity that are not accounted for here because they have no specific online date.

Table 5.9 - Number of Utilities by Class of Ownership and Nonutilities

	1980	1990	1999	2000	2002
Investor Owned Utilties	240	266	239	240	217
Federally Owned Utilities	41	10	9	9	12
Cooperatively Owned Utilities[1]	936	951	900	894	889
Other Publicly Owned Utilities	1,753	2,010	2,012	2,009	1,870
Total Number of Utilities	2,970	3,237	3,160	3,152	2,988
Nonutilities			1,930		

Source: EIA, *The Changing Structure of the Electric Power Industry 2000: An Update*; Electrical World: Directory of Electric Power Producers, The McGraw-Hill Companies

Notes:
[1] Co-ops operate in all states except Connecticut, Hawaii, Rhode Island, and the District of Columbia

Table 5.10 – Top 10 Investor-Owned Utilities

Utility by Sales (Million kWh)	**1990**		**2000**	
	Rank	Million kWh	Rank	Million kWh
TXU Electric Co	1	78,340	1	100,885
Florida Power & Light Co	5	65,222	2	88,128
Commonwealth Edison Co	2	70,852	3	77,176
Georgia Power Co	8	53,953	4	74,434
Reliant Energy HL&P	6	58,583	5	73,716
Southern California Edison Co	4	70,063	6	73,686
Pacific Gas & Electric Co	3	70,597	7	72,121
Virginia Electric & Power Co	9	52,122	8	65,294
Duke Energy Corp	7	58,359	9	53,726
Alabama Power Co	12	38,081	10	52,068
PacifiCorp	10	40,288	43	18,859

Utility by Revenue (Million $)				
	Rank	Million $	Rank	Million $
Southern California Edison Co	1	6,767	1	7,416
Pacific Gas & Electric Co	2	6,513	2	6,988
TXU Electric Co	6	4,200	3	6,433
Florida Power & Light Co	4	4,803	4	6,065
Commonwealth Edison Co	3	5,668	5	5,723
Consolidated Edison Co-NY Inc	5	4,385	6	5,286
Reliant Energy HL&P	7	3,436	7	4,743
Georgia Power Co	8	3,426	8	4,283
Virginia Electric & Power Co	9	3,299	9	4,022
Detroit Edison Co	12	3,187	10	3,834
Public Service Electric & Gas Co	10	3,262	11	3,247

Source: EIA, *Electric Sales and Revenue*, DOE/EIA -0540 (00) (Washington, D.C., January 2002), Table 17.

Table 5.11 - Top 10 Independent Power Producers Worldwide, 2002

(Megawatts)

Company	Worldwide Capacity (2002)
AES	55,660
Tractebel	50,000
Dominion Generation	23,830
Mirant	22,100
Entergy Wholesale Operations	21,323
NRG Energy	20,954
Calpine	19,319
Edison Mission Energy	18,688
Dynegy	13,167
Cinergy	13,112

Source: Company SEC filings at http://www.sec.gov/ accessed on 4/23/2003, except for Tractebel: http://www.tractebel.be/about_tractebel/international/internationalmap_en.asp accessed 4/23/2003.

Table 5.12 - Utility Mergers and Acquisitions

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Mergers/Acquisitions															
IOU-IOU	4	1	2	1	7	4	1	3	1	5	10	4	10		
Co-op-Co-op	4	3	2	2	7	2	1	4	2	13	15	15	3	1	
IOU-Co-op				1	2			1		1					
IOU-Gas [1]									1	5	4	3	6		
Muni-Muni								1				2			
Muni-Co-op										1			1		
Power Authority-IOU											1				
Nonutility-IOU													6		
Foreign-IOU [2]												2	2		
Total	8	4	4	4	16	6	2	9	4	25	30	26	27		
Related Activities															
Name Changes									5	2	7	11	1		
New Holding Company										1	5	4	2	3	
Moved Headquarters						1									
Ceased Operations											1				

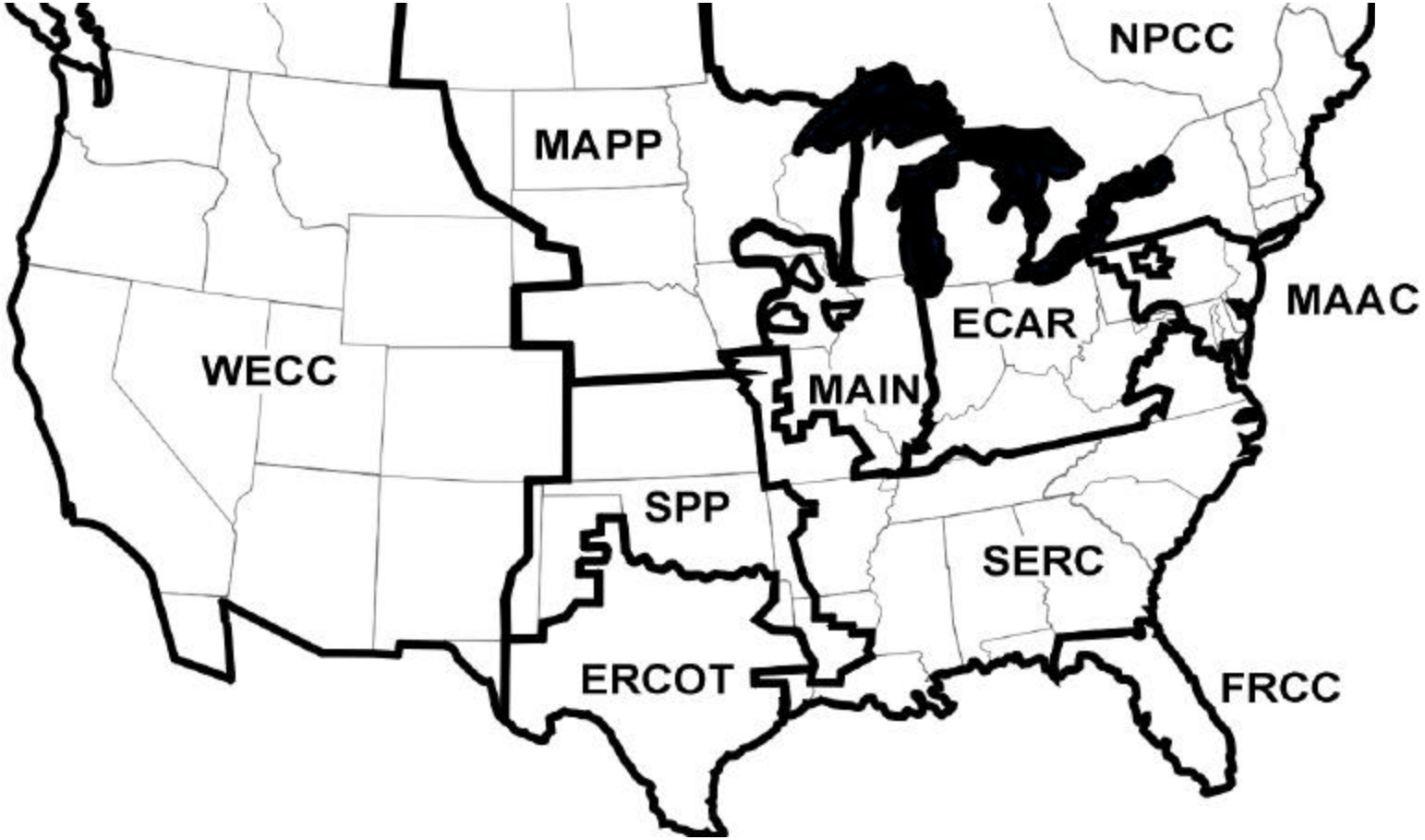
Source: Calculated from Electrical World, D*irectory of Electric Power Producers*, 2003, The McGraw-Hill Companies

Notes:

[1] Gas local distribution company, pipeline, or developer

[2] Excludes Canadian mergers and acquisitions. Includes foreign acquisition of U.S. companies

Table 5.13a - North American Electric Reliability Council Map for the United States



ECAR	**ECAR East Central Area Reliability Coordination Agreement**
ERCOT	**Electric Reliability Council of Texas**
FRCC	**Florida Reliability Coordinating Council**
MAAC	**Mid-Atlantic Area Council**
MAIN	**Mid-Atlantic Interconnected Network**
MAPP	**Mid-Continent Area Power Pool**
NPCC	**Northeast Power Coordinating Council**
SERC	**Southeastern Electric Reliability Council**
SPP	**Southwest Power Pool**
WECC	**Western Electricity Coordinating Council**
ASCC	**Alaskan Systems Coordinating Council**

Source: North American Electric Reliability Council, www.nerc.com

Table 5.13b - Census Regions

Source: U.S. Department of Commerce, Bureau of the Census, www.census.gov